



Electro-Voice®

a MARK IV company

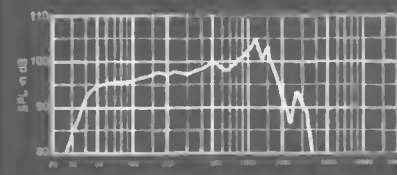


FIGURE 1
Axial Frequency Response, 1 Watt/1 Meter
5.0-Cubic-Foot Enclosure

EVX-150A

15-Inch
Low-Frequency
Reproducer

SPECIFICATIONS

Power Handling:

1000 watts continuous program

Voice Coil Diameter:

102 mm (4 in.)

Sensitivity (SPL/1 W/1 M),

100-800-Hz Average:
98 dB

Impedance:

8 ohms

Frequency Response (see Figure 1):

30-1800 Hz

Highest Recommended Crossover:

800 Hz

Magnet Assembly Weight:

7.7 kg (17 lbs)

THIELE-SMALL PARAMETERS

f_s : 35.4 Hz

R_s : 5.8 ohms

Q_{ts} : 0.240

Q_{ms} : 5.65

Q_{es} : 0.251

V_{as} : 220 L (7.77 cu. ft.)

S_d : 0.079 sq. m (123 sq. in.)

X_{max} : 6.35 mm (0.25 in.)

Displacement Limit:

36 mm (1.41 in.) peak to peak

η_o : 3.72%

P_o : 600 watts EIA RS-426A

500 watts continuous sine wave

$$V_d = 30.75 \text{ in}^3$$

DESCRIPTION

The EVX-150A series low-frequency transducers are designed for professional sound reinforcement or studio monitoring applications that require maximum output with low distortion.

EVX-150A provides unprecedented power capacity, linearity, and excursion made possible by the HeatWick™ total-thermal-engineering design. The proprietary HeatWick design actually "wicks" heat away from the voice coil, significantly increasing power handling and long-term reliability. A special frame extension and elongated pole piece provide a metal surface with close proximity to the entire length of the voice coil, providing a major heat-transfer path. Also, the 100-mm (4-in.) diameter voice coil is longer than conventional high-efficiency woofers to give additional power handling and virtually eliminate dynamic-range power compression.

Additionally, a Flux Demodulation Device (FDD™) reduces distortion in the critical midband by providing a "short circuit" effect to prevent amplifier-signal modulation of the static magnetic field. To further increase reliability, PROTEF™* Teflon® coating is applied to the internal diameter of the FDD™ end top plate. PROTEF lubricates any rubbing contact and electrically insulates the coil from the FDD end top plate to guard against violent short-term power peaks.

A ribbed Kevlar®-fiber composite cone with an extremely high stiffness-to-weight ratio and exceptional strength gives the EVX-150A increased resistance to cone collapse and deformation, without sacrificing efficiency or midrange response.

*Patent #4,547,632

FEATURE HIGHLIGHTS

- **HeatWick™ Design**
Provides advanced thermal engineering to "wick" heat away from the voice-coil for increased power handling and reliability.
- **Extended-Length 100-mm (4-in.) Voice Coil**
Has nearly twice the surface area of any other woofer to virtually eliminate dynamic-range power compression.
- **Kevlar-Fiber Composite Cone**
For added protection against cone collapse and breakup, without adding efficiency-robbing weight.
- **Flux Demodulation Device (FDD™)**
Considerably reduces midband distortion by preventing amplifier-signal modulation of the static magnetic field.
- **Rubber Mounting-Flange Gasket**
Provides a reusable seal for front or rear mounting, completely surrounding the frame flange.
- **1,000-Watt Continuous Program**
Power capacity, without efficiency sacrifice, for extremely high output with low distortion.

DIRECTIONAL PERFORMANCE

The directional characteristics of the EVX-150A in a 90-L (3.2-ft³) vented enclosure were measured by running a set of polar responses in EV's large anechoic chamber (see Figure 6). The test signal was octave-band-limited pseudo-random pink noise centered at the ISO standard frequencies.

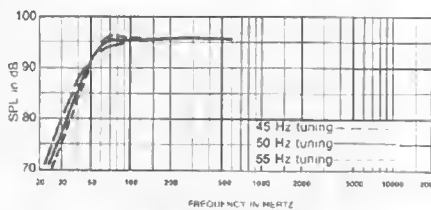


FIGURE 2A — EVX-150A
Single-Driver Low-Frequency
Performance: 71-L (2.5-ft³) Enclosure

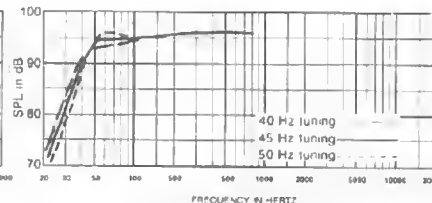


FIGURE 2B — EVX-150A
Single-Driver Low-Frequency
Performance: 99-L (3.5-ft³) Enclosure

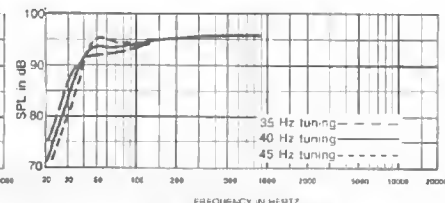


FIGURE 2C — EVX-150A
Single-Driver Low-Frequency
Performance: 141-L (5.0-ft³) Enclosure

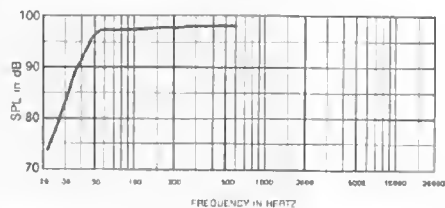


FIGURE 2D — EVX-150A
Multiple-Driver Low-Frequency
Performance: 2 Drivers in a
283-L (10-ft³) Box or 2
141-L (5-ft³) Boxes in Close
Proximity Tuned to 44 Hz

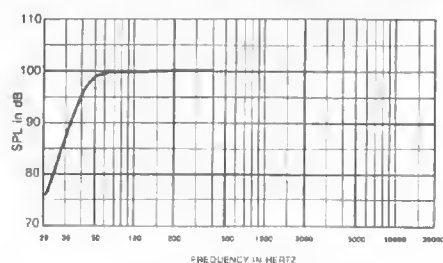


FIGURE 2E — EVX-150A
Multiple-Driver Low-Frequency
Performance: 4 Drivers in a
566-L (20-ft³) Box or 2
283-L (10-ft³) Boxes in Close
Proximity Tuned to 42 Hz

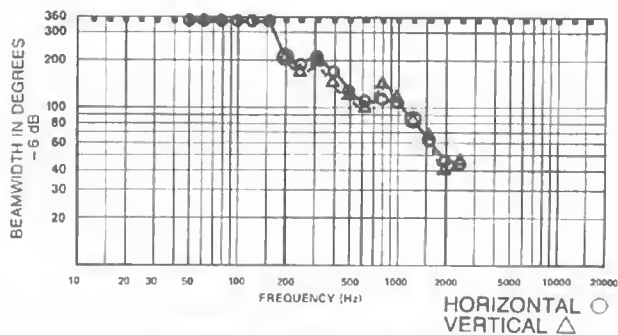


FIGURE 3 — Beamwidth vs. Frequency
EVX-150A/TL606A in a 90-L (3.2-ft³) Enclosure

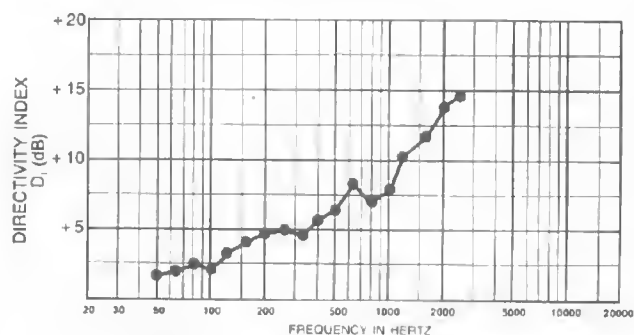


FIGURE 4 — Directivity Index vs. Frequency
EVX-150A/TL606A in a 90-L (3.2-ft³) Enclosure

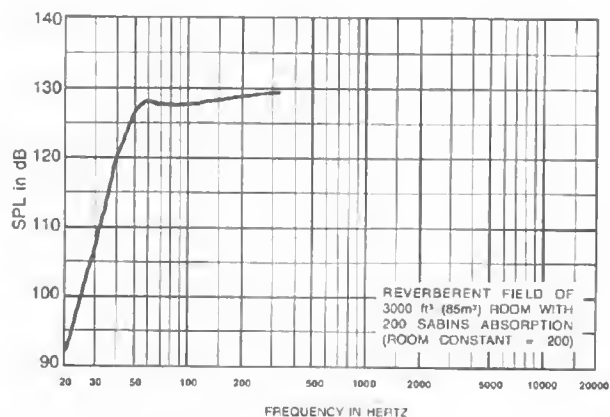


FIGURE 5 — Theoretical Low-Frequency
Maximum SPL vs. Frequency
283-L (5-ft³) Enclosure Tuned to 45 Hz

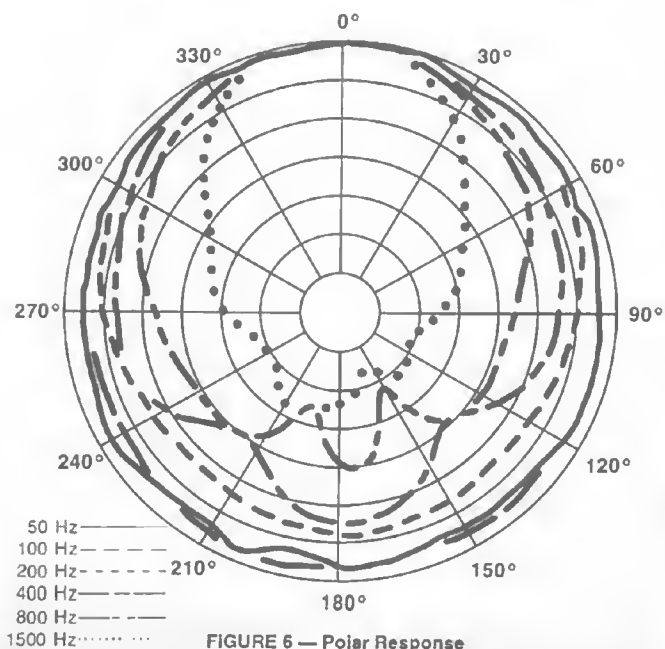


FIGURE 6 — Polar Response

The curves show horizontal (side-to-side) dispersion when the enclosure's long axis is vertical. The vertical (up-and-down) polar responses deviate only slightly from the horizontal responses due to box geometry. Typical data is provided in Figures 3 and 4 which indicate 6-dB-down beamwidth versus frequency and directivity factor, respectively, for an EVX-150A in the TL606A enclosure.

POWER HANDLING TEST

To our knowledge, Electro-Voice was the first U.S. manufacturer to develop and publish a power test closely related to real-life conditions. First, we use a random noise input signal because it contains many frequencies simultaneously, just like real voice or instrument program. Second, our signal contains more energy at extremely high and low frequencies than typical actual program, adding an extra measure of reliability. Third, the test signal includes not only the overall "long-term average" or "continuous" level—which our ears interpret as loudness—but also short-duration peaks which are many times higher than the average, just like actual program. The long-term average level stresses the speaker thermally (heat). The instantaneous peaks test mechanical reliability (cone and diaphragm excursion).

Specifically, the EVX-150A model is designed to withstand the power test described in EIA Standard RS-426A. The EIA test spectrum is applied for eight hours. To obtain the spectrum, the output of a white noise generator (white noise is a particular type of random noise with equal energy per bandwidth in Hz) is fed to a shaping filter with 6-dB-per-octave slopes below 40 Hz and above 318 Hz. When measured with the usual constant-percentage-bandwidth analyzer (one-third octave), this shaping filter produces a spectrum whose 3-dB-down points are at 100 Hz and 1200 Hz with a 3-dB-per-octave slope above 1200 Hz. The signal has a 6-dB crest factor. This procedure provides a rigorous test of both thermal and mechanical failure modes.

The EVX-150A has also been power tested with a two hour sine wave, at minimum impedance, so that competitive comparisons can be made using consistent methods. Continuous program power is defined as 3-dB above (double) the continuous sine-wave power rating.

RECOMMENDED ENCLOSURES

The most extended bass, lowest distortion, and best control is usually realized in properly designed vented enclosures. In such designs, the vent, or port, actually provides the lowest octave of output. The vent is driven to full acoustic output by a relatively small motion of the speaker cone itself, acting through the air contained within the enclosure. The excursion of the EVX-150A at these frequencies is much reduced compared to sealed or open back enclosures, directly reducing harmonic distortion and the possibility of speaker "bottoming." Several specific vented enclosure recommendations are shown on the previous page. Alternate tunings are given so that designers can tailor the low-frequency response to their specific needs. Figure 5

shows the maximum long-term SPL versus frequency. The maximum output is limited by either: 1) the long-term thermal, power handling capacity, or, 2) the speaker's maximum cone excursion capability, whichever occurs first. Also provided are recommended enclosures for multiple driver configurations.

STEP-DOWN OPERATION

For extended low frequency operation, the vent area can be reduced by one-half, thereby tuning the enclosure to the "step down" mode. In step-down, the tuning frequency is reduced by one-half octave (a factor of 0.7). The resulting alignment is then equalized for flat response. This procedure results in one-half octave lower bass.

ARCHITECTS' AND ENGINEERS' SPECIFICATIONS

The low-frequency transducer shall have a nominal diameter of 381 mm (15 in.), overall depth not greater than 168 mm (6.71 in.), and weigh no more than 10 kg (22 lbs). The frame shall be made of die-cast aluminum to resist deformation. The magnetic assembly shall have an extended pole-piece to reduce inductive variances with excursion, and provide a symmetrical magnetic field at the voice-coil gap. Two aluminum rings shall encircle the pole piece above and below the magnetic gap, and shall have internal diameters concentric with the internal diameter of the steel top-plate. The upper ring shall be part of the loudspeaker frame. Both rings act to reduce flux modulation and provide a heat-transfer path from the outer diameter of the voice coil. The inside diameter of the lower aluminum ring and the inside diameter of the steel top plate shall be Teflon® coated.

The voice coil shall be 100 mm (4 in.) in diameter and 20.3 mm (0.8 in.) in winding length, and shall be made of edgewound aluminum ribbon. When centered in the magnetic gap, the voice coil shall produce a force of not less than 20.64 Newtons (Tesla-Ampere-Meters) with a dc current of 1 ampere.

Performance specifications of a typical production unit shall be as follows: Measured sensitivity [SPL at 1 m (3.3 ft.) with 1-watt input, averaged between 100-800-Hz pink noise] shall be at least 98 dB. The half space reference efficiency shall be at least 3.7%. The usable response frequency shall be 30 Hz to 1.8 kHz, and the nominal impedance shall be 8 ohms. The rated power for the loudspeaker shall be 1000 watts normal program material.

The low-frequency transducer shall be the Electro-Voice EVX-150A.

AES SPECIFICATIONS

The following specifications are in accordance with the "AES Draft Recommended Practice for Specification of Loudspeaker Components Used in Professional Sound Reinforcement Systems — 1983."

Dimension and Weight,

Outer Diameter:
38.8 mm (1.528 in.)

Depth:
168 mm (6.71 in.)
Bolt Hole Diameter:
7.1 mm (0.281 in.)
Net Weight:
10 kg (22 lb)
Shipping Weight:
12.3 kg (27 lb)

Mounting:

The EVX-150A may be front- or rear-mounted against either surface of its mounting flange and requires a 353-mm (13.9-in.) diameter cutout and a 371-mm (14.6-in.) bolt circle. Normal fasteners up to 6 mm (1/4 in.) will fit through the eight holes in the frame. Front mounting is simplest using the optional SMH-1 speaker mounting kit.

Electrical Connections:

The EVX-150A is fitted with a pair of chrome-plated frame-mounted connectors with color-coded ends. Electrical connection is made by pushing down, inserting wire completely through the rectangular slot and releasing pressure. One conductor of #9 AWG stranded, #8 AWG solid, a pair of twisted #15 AWG stranded or a pair of #14 AWG solid conductors will fit. A positive electrical signal applied to the red (+) terminal will displace the cone away from the magnet, thus producing a positive acoustic pressure.

ADDITIONAL DESCRIPTIVE INFORMATION:

Voice-Coil Material:

Aluminum

Voice-Coil Insulation:

Polyimide, 220 degree C reting

Coil Form:

Polyimide

Frame:

Cast aluminum

Plating of Steel Parts:

Bright cadmium

Thermal Rise after Power Test:

82 degrees C (147 degrees F)

Recommended Enclosures:

3-7 cubic foot (85 L-198 L)

Physical Constants,

Effective Piston Diameter:

318 mm (12.5 in.)

Total Moving Mass:

0.069 kg

Voice-Coil Winding Depth:

20.3 mm (0.8 in.)

Voice-Coil Winding Length:

35.22 m (115.52 ft.)

Top Plate Thickness at Voice Coil:

8.89 mm (0.35 in.)

Z_{min}:

7.2 ohms

BI Factor:

20.4 T.m

Thiele-Small Parameters:

f_s: 35.4 Hz

R_s: 5.8 ohms

Q_{ts}: 0.240

Q_{ms}: 5.65

Q_{es}: 0.251

V_{as}: 220 L (7.77 cu. ft.)

S_d: .079 sq. m (123 sq. in.)

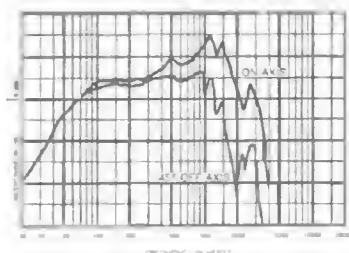
X_{max}: 6.35 mm (0.25 in.)

η_o: 3.72%

P_s: 600 watts EIA RS-426A

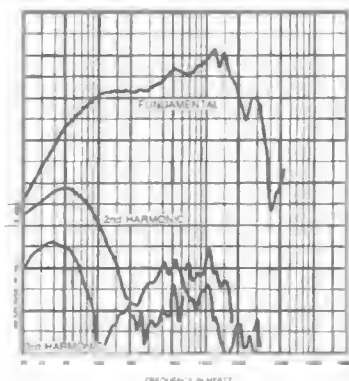
500 watts continuous sine wave

Response In Standard Baffle

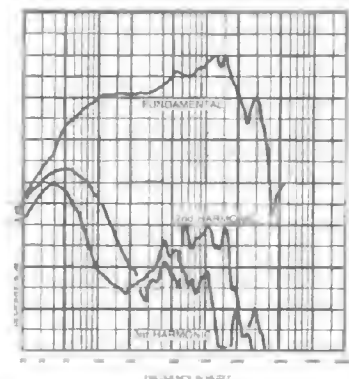


NOTE: AES requires a large, planar baffle for this test, WHICH IS INTENDED TO SHOW SMOOTHNESS AND OFF-AXIS RESPONSE, NOT BASS RESPONSE. This has proven to be inconvenient and prohibitive, due to its size. Here, we have chosen our lab standard low-diffraction 12-cubic-foot test enclosure, which will demonstrate the same characteristics as the "AES standard baffle."

Distortion Response

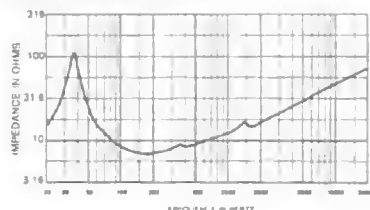


6 WATTS



60 WATTS

Impedance Response:



MULTIPLE DRIVER APPLICATION:

When used in arrays and multiple driver bass boxes, the system Thiele-Small parameters can be synthesized as follows. This data should be used for multiple-driver configurations.

Two (2) Drivers:

f_s : 34.3 Hz
 Q_{ts} : 0.248
 V_{as} : 15.5 cu. ft. (439 L)

Four (4) Drivers:

f_s : 32.9 Hz
 Q_{ts} : 0.258
 V_{as} : 31.1 cu. ft. (880 L)

Designers will find the following equation useful in tuning their enclosures:

$$L_v = \frac{S_v}{3.7 \times 10^{-4} V_b f_s^2} - K r$$

Where:

- L_v = Length of vent or thickness of baffle, for hole in baffle, in inches
- S_v = Area of vent in square inches
- V_b = Volume of box in cubic feet
- f_s = Box tuning in Hz
- r = Radius of vent in inches
- K = 1.7 for a hole in baffle 1.5 for a tube

WARRANTY (Limited) —

Electro-Voice products are guaranteed against malfunction due to defects in materials or workmanship for a specified period, as noted in the individual product-line statement(s) below, or in the individual product data sheet or owner's manual, beginning with the date of original purchase. If such malfunction occurs during the specified period, the product will be repaired or replaced (at our option) without charge. The product will be returned to the customer prepaid. Exclusions and Limitations: The Limited Warranty does not apply to: (a) exterior finish or appearance; (b) certain specific items described in the individual product-line statement(s) below, or in the individual product data sheet or owner's manual; (c) malfunction resulting from use or operation of the product other than as specified in the product data sheet or owner's manual; (d) malfunction resulting from misuse or abuse of the product; or (e) malfunction occurring at any time after repairs have been made to the product by anyone other than Electro-Voice or any of its authorized service representatives. Obtaining Warranty Service: To obtain warranty service, a

customer must deliver the product, prepaid, to Electro-Voice or any of its authorized service representatives together with proof of purchase of the product in the form of a bill of sale or receipted invoice. A list of authorized service representatives is available from Electro-Voice at 600 Cecil Street, Buchanan, MI 49107 (616/695-6831) and/or Electro-Voice West, at 8234 Doe Avenue, Visalia, CA 93291 (209/651-7777). Incidental and Consequential Damages Excluded: Product repair or replacement and return to the customer are the only remedies provided to the customer. Electro-Voice shall not be liable for any incidental or consequential damages including, without limitation, injury to persons or property or loss of use. Some states do not allow the exclusion or limitation of incidental or consequential damages so the above limitation or exclusion may not apply to you. Other Rights: This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Electro-Voice Speakers and Speaker Systems are guaranteed against malfunction due to defects in materials or workmanship for a period of five (5) years from the date of original purchase. The Limited Warranty does not apply to burned voice coils or malfunctions such as cone and/or coil damage resulting from improperly designed enclosures. Electro-Voice active electronics associated with the speaker systems are guaranteed for three (3) years from the date of original purchase. Additional details are included in the Uniform Limited Warranty statement.

Service and repair address for this product: Electro-Voice, Inc., 600 Cecil Street, Buchanan, Michigan 49107.

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Kevlar® is a registered trademark of Du Pont Corporation.



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